where,

$|E^*|$, E" = axial stiffness, and loss stiffness in psi;

AC = asphalt content: -1 and +1 for opt.-0.5% and opt.;

GR = aggregate gradation: -1 and +1 for SP 12.5-mm and SP 19-mm;

V_a = air void content in percent;

Temp = test temperature: -1,0, and +1 for 15, 20 and 25°C, respectively;

$Freq$ = frequency in Hz; and

exp = e: base of natural log.

It can be seen from these models that axial stiffness as well as loss stiffness is sensitive to all mix and test variables considered in this study.

5.4.2 Surrogate models for phase angle

The summary of regression analysis for axial phase angle is given in Table 5-5. It was found in this study that the phase angle is dependent on |E*| and the frequency. The model with variable frequency is:

$$f = -379.61 + 177.85 \cdot \log|E^*| - 18.5 \cdot (\log|E^*|)^2 + 1.942 \cdot \log(f) \qquad R^2 = 0.88 \qquad (5.5)$$

where,

f = phase angle in degree;

$|E^*|$ = axial dynamic modulus in psi;

f = frequency in Hz; and

log = logarithm to base 10.

For the phase angle at 10 Hz frequency, equation (5.5) reduces to: